MILTHA IN THE SOUTH-EASTERN AUSTRALIAN TERTIARY

By R. W. T. WILKINS, M.Sc.*

Plate 5, Figure 1.

A recent visit to Flinders Island, Tasmania, and field work in Gippsland, Victoria, has brought to light several specimens of the rare species *Miltha flindersiana* Singleton and Woods, which until the present has been known only from portion of a somewhat worn right valve. Accordingly it is felt that a review of this species is warranted and at the same time the opportunity is taken to introduce some comments on palaeogeography in the Upper Miocene—Lower Pliocene of south-eastern Australia.

FAMILY LUCINIDAE

Genus *MILTHA* H. and A. Adams, 1857.
Miltha flindersiana Singleton and Woods.
(Pl. 5, figs. 1, 2.)

Miltha (Milthoidea) grandis flindersiana. Singleton and Woods, 1934, *Proc. Roy. Soc. Vict.* 46 (2), p. 210, pl. 8, figs. 4a-b.

The new material from Flinders Island which makes it possible to raise the subspecies to a full species consists of the one right and one left valve from the northern end of Nelson Drain (ref. 030614 on Dimmock's soil map, 1957) in the Cameron Inlet Marl. Another specimen was obtained from the lime quarry at the foot of the Dutchman in the Dutchman Coquinoid Limestone (Gill, 1962). Associated faunas indicate that the beds at both localities are approximately equivalent and of Lower Pliocene age though probably somewhat younger than Kalimnan.

There is not much to be added to the description given by Singleton and Woods but it should be noted that the internal ventral margin is not crenulated and that an obsolete anterior tooth is present on the right valve. Internal features can be observed in some detail on P. 22322 (National Museum of Victoria, Melbourne) from the northern end of Nelson Drain. A system of furrows and ridges radiates from beneath the hinge plate; an angular anterior ridge and associated weak furrow joining to just below the dorsal end of the anterior adductor, a more rounded posterior ridge joining to the ventral end of the posterior adductor while an ill-defined furrow passes obliquely across the valve in a slightly sigmoidal line from above the ventral end of the anterior adductor to about the mid-point of the posterior ridge. The posterior ridge is flanked by two shallow furrows which join the median furrow leaving a small ridge between them.

Miltha flindersiana dennanti subsp. nov.
(Pl. 5, figs. 3, 4.)

The holotype consists of an external mould of a left valve (P. 22320, National Museum of Victoria, Melbourne) and the associated steinkern (P. 22321), both in a good state of preservation.

Description of holotype: Shell rather small for the genus, subcircular, compressed, umbonal area missing; lunule small, deeply impressed; surface

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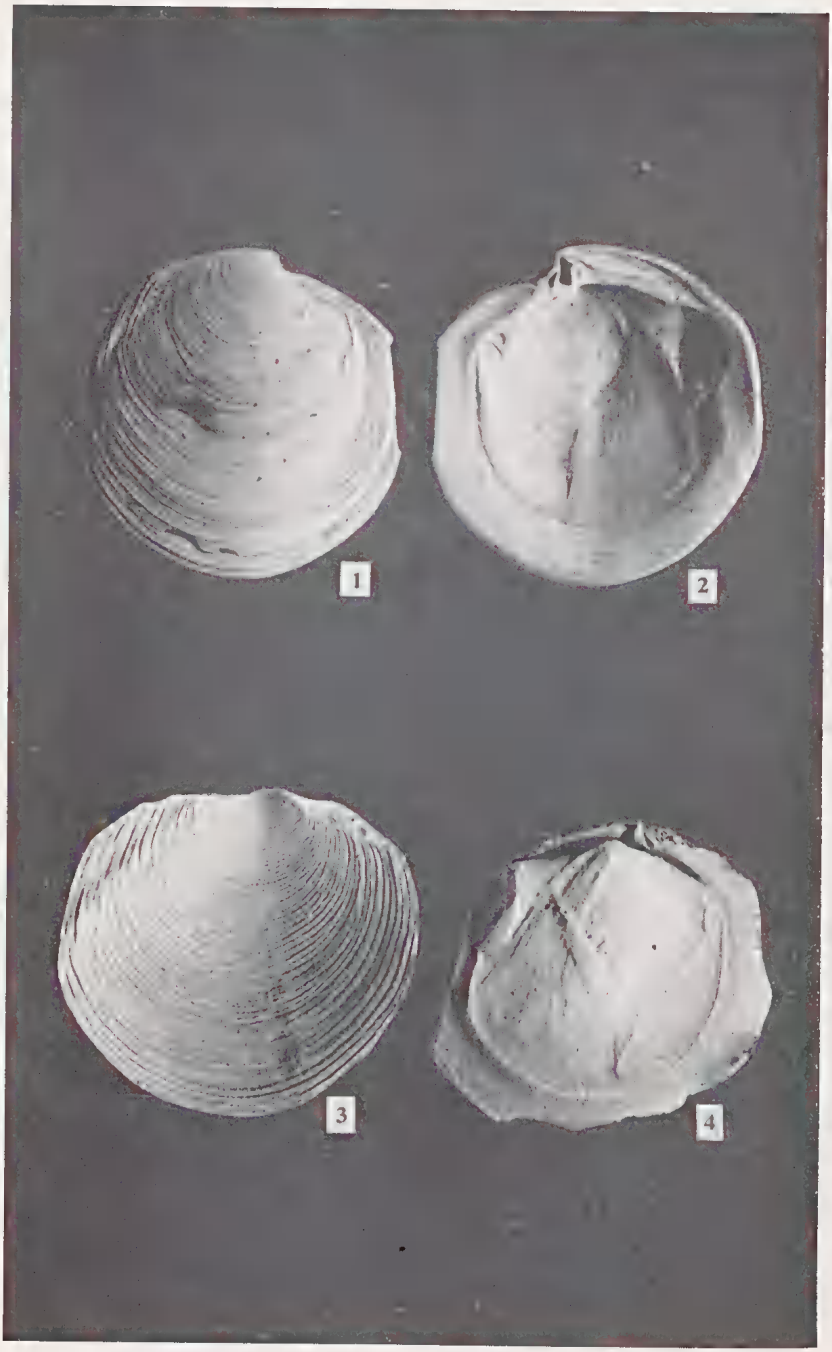

PLATE 5.

sculpture dominantly concentric, of closely and fairly regularly spaced sharp riblets of approximately even development over the whole central area, fine radial markings on ventral portion, irregular and discontinuous, uniting and bifurcating. Slightly anterior to the median position obscure radial lines cross an area of confused concentric riblets. Anterior dorsal area small, well defined, divided by a radial line, concentric lirae; posterior dorsal area large, defined by a prominent radial sulcus, one in two or three of concentric riblets on the body of the shell continuing across this area.

Hinge plate evidently similar to *M. flindersiana flindersiana* but anterior tooth on right valve unusually well developed for the genus. Internal markings also similar, but the two posterior radial furrows better defined and further apart leaving a flattened area between. Medial furrow straight, relatively wide and deep and not sigmoidal as in *M. flindersiana flindersiana.* Interior of left valve similar but with ridge and furrow system not so deeply developed; medial furrow slightly sigmoidal. Muscle scars closely similar in the two subspecies. Interior of valves within the pallial line with radial lines and traces of punctation. Internal margin smooth.

Type locality: "Bellevue", Mitchell River, Victoria (Dennant and Clark, 1903).

Material: Holotype from ferruginous sandstone of the upper quarry, Bellevue section, Mitchell River. Dennant Coll., National Museum of Victoria. Another specimen in the writer's collection is an imperfect cast and mould of a smaller (length *c.* 2.5 cm.) left valve from the same locality.

Age: Associated fauna indicates a Cheltenhamian (U. Miocene) or Kalimnan (L. Pliocene) age (Wilkins, 1963).

Observations: The differences between the subspecies of *M. flindersiana* have been partly indicated in description. In addition the new subspecies has a coarser concentric sculpture, wider posterior dorsal area and a better developed median radial area of sculptural overlap.

Both subspecies are separated from *M. hora* (Cotton) (*nom. nov.* for *Dosinia grandis* N. H. Woods [Ludbrook 1955]), the South Australian fossil species by smaller size, being distinctly less compressed at equivalent size, having better development of the anterior tooth in the right valve and by details of internal ridges and furrows. Although *M. flindersiana*

EXPLANATION OF PLATE 5

Fig. 1: P. 22322. *Miltha flindersiana flindersiana.* Hypotype. Northern end of Nelson Drain, Flinders Is.

Fig. 2: Same specimen as in figure 1. Internal view.

Fig. 3: P. 22320. *Miltha flindersiana dennanti subsp. nov.* Holotype. "Bellevue", near Bairnsdale, Mitchell River, Vict. Internal cast of right valve. External mould in ferruginous sandstone, left valve.

Fig. 4: P. 22321. Same as figure 3. Internal cast of right valve, steinkern in ferruginous sandstone.

All figures 1.5 approximately. Specimens puffed with ammonium chloride before photography.

never has a crenulated internal margin, it is also not invariably present in *M. hora*. Internal thickening and development of hinge features are clearly dependent on size. Comparative measurements are shown in Table 1.

Although *dennanti* is at least externally quite distinct, it is believed that the relationships of the Australian forms are best shown, for the present, by the inclusion of both Victorian and Tasmanian representatives in the same species.

Uncertainty still surrounds *Miltha* from Beaumaris, Victoria. Singleton and Woods (1934) recorded the genus on the basis of an imperfect right valve in the collection of Mr. L. W. Stach but it now appears to be lost (oral communication). A search of the collections of the National Museum of Victoria has yielded one abraded internal cast from the shingle at the base of the cliffs at Beaumaris, the right side of the cast having the characteristic long anterior muscle scar and a pronounced medial furrow joining it to the posterior muscle scar. Another specimen with shelly material badly decomposed and abraded can also be identified by the anterior muscle scar. Neither specimen shows sufficient characters for accurate determination but on the basis of size, which would be about that recorded for *M. flindersiana*, and what can be seen of both internal markings and external sculpture it may be recorded as *M. flindersiana subsp. indet.*

TABLE 1.

Specimen	Length equivalent to height = 30 mm.	Height	Thickness of valve at height = 30 mm.	Valve
P. 22322. Nelson Drain, Flinders Is. Hypotype	30	29	4.8	Right
Dutchman lime quarry, Flinders Is.	30	32	4.9	Right
P. 22320. "Bellevue", Bairnsdale, Vict. Holotype	30	30 est.	5.0	Left
M. 307 Cowandilla Bore, 485′-507′, Adelaide.	31	—	3.2	Left
M. 307 Cowandilla Bore, 485′-507′, Adelaide.	32 est.	81	3.4	Right
M. 305 Cowandilla Bore, 470′-485′, Adelaide.	—	85	3.0	Right
M. 303 Hindmarsh bore, 450′-487′, Adelaide.	32	77	3.5	Right
M. 303 Hindmarsh bore, 450′-487′, Adelaide.	32	65 est.	3.6	Left

All dimensions are in millimetres. Numbers with prefix P. refer to specimens in the collections of the National Museum of Victoria, Melbourne; those with prefix M. refer to specimens in the collection of the South Australian Mines Department.

Singleton and Woods noted that their Beaumaris specimen had a more curved post-umbonal margin than *M. hora* and was less depressed than the Flinders Island shell upon which *flindersiana* was based. According to the data now at hand, which includes five more or less complete valves of *M. hora* from the Dry Creek Sands, kindly forwarded to the writer by Dr. N. H. Ludbrook, neither character can be considered of diagnostic importance on the basis of a single specimen.

Beyond Australia the affinities of the Australian species are with *Miltha neozelanica* Marshall and Murdoch, the type species of the subgenus *Milthoidea* (Marwick, 1931). It is very closely related to the Australian species. More recently Chavan (1938; Ludbrook, 1955) has synonomised *Milthoidea* with *Miltha* but the three species form such a closely related group that some taxonomic designation is perhaps desirable.

DISTRIBUTION OF AUSTRALIAN *MILTHA*.

The recorded occurrences of *Miltha* in south-eastern Australia are shown in text figure 1. The extent of Austral-Indo-Pacific and Bass Strait provinces (Crespin, 1950) in the U. Miocene-L. Pliocene as determined

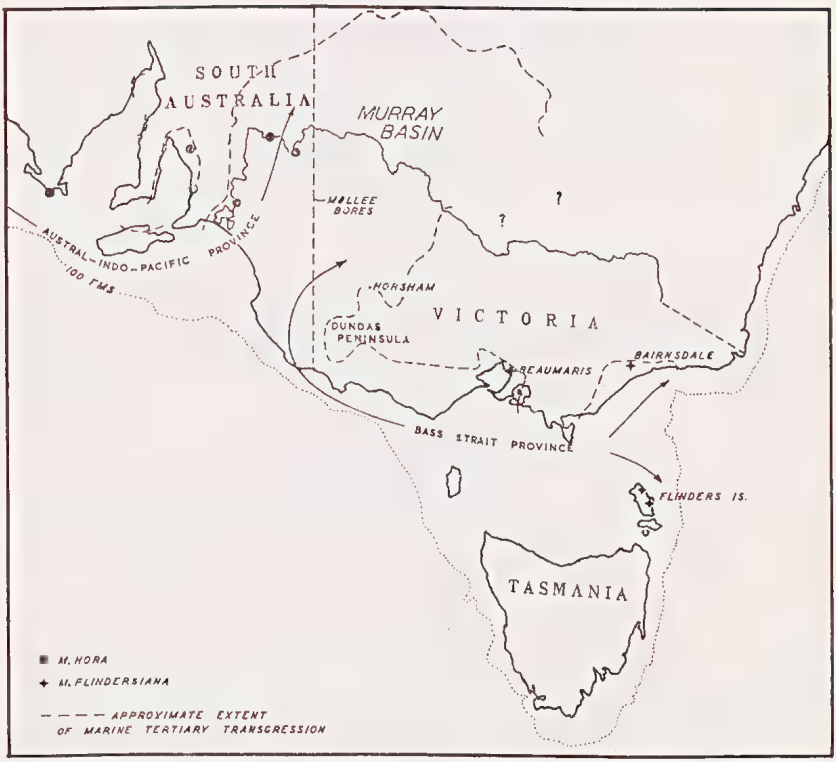

Figure 1.

by molluscan faunas is also shown. It will be observed that each species of *Miltha* is limited to one province. The existence of geographical provinces especially at this horizon where foraminiferal evidence is poor has resulted in considerable difficulty for correlation.

The barrier separating the two provinces is difficult to ascertain. Ludbrook (1954) has criticized the use of the term Bass Strait province suggesting that it is inappropriate mainly because Bass Strait was not in existence at this time. However, the widespread occurrence of Tertiary deposits in the Bass Strait area suggests that this was not so (Gill, 1962).

Appealing to faunal evidence we find that data from Tertiary land faunas is virtually non-existent, but marine molluscan faunas from all Victorian Tertiary basins are sufficiently closely related to make the suggestion of any permanent land barrier between Victoria and Tasmania, from the Oligocene at least, difficult to maintain. Such a barrier would have been a formidable obstacle to the migration of species between the Gippsland Basin in eastern Victoria and the Otway Basin in western Victoria.

Text figure 1 also shows the approximate extent of marine Tertiary transgression in south-eastern Australia. Although this does not necessarily correspond to the extent of Upper Miocene and Lower Pliocene seas it probably indicates the general outline of this portion of the continent at that time. Clearly the Dundas Peninsula was a possible geographical barrier but Pliocene fossils from Horsham (Dennant, 1902) and the Mallee bores (Chapman, 1916) both in the Victorian part of the Murray Basin show relationships with those of the Bass Strait province. The reason for co-existence of faunas belonging to two provinces in the Murray Basin remains unexplained but could be related to actual but unknown land-sea relations in this area. The future discovery of *Miltha* from the critical area can be looked forward to with interest.

ACKNOWLEDGEMENTS:

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NOTES ON THE SPAWN AND EARLY LIFE HISTORY OF TWO SPECIES OF *CONUBER* FINLAY & MARWICK, 1937 (NATICIDAE).

By FLORENCE V. MURRAY, M.Sc.°

Plates 6-9.

ABSTRACT.

C. conicum and *C. sordidum* differ from other naticids whose breeding is known, in spawning gelatinous egg masses rather than sand-encrusted egg collars. The larvae of both species hatch as free-swimming planktotrophic veligers.

Genus *CONUBER* Finlay & Marwick, 1937, Palaeont. Bull. N.Z. 15: 53.

Natica conica Lamarck, 1822, Anim. s. Vert., 6, (2): 198.

Natica sordida Swainson, 1821, Zool. Illustr., 1: pl. 79.
= *Natica plumbea* Lamarck, 1822, Anim. s. Vert., 6, (2): 198.
= *Natica strangei* Reeve, 1855, Conch. Icon., 9, *Natica* pl. 18, fig. 81.

INTRODUCTION.

The existence of an atypical naticid spawn had remained unrecognised until February, 1962, when the specimen (Nat. Mus. Vict., No. F. 22726) of the Conical Sand Snail, *Conuber conicum* (Lamarck, 1822), which had been isolated in a small home aquarium produced a large gelatinous

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